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AN IMPROVED METHOD OF SEPARATING BUCKHORN FROM RED CLOVER AND ALFALFA SEEDS.

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AN IMPROVED METHOD OF SEPARATING BUCKHORN FROM RED CLOVER AND ALFALFA SEEDS.[a]

INTRODUCTION.

Many varieties of weeds are more or less commonly found in clover and alfalfa. Among these none is more common or more pernicious than buckhorn (*Plantago lanceolata* L.). This weed, which is also known as English plantain, rib-grass, and ribwort, is a perennial plant (fig. 1) naturalized in this country from Europe. It fruits freely and can not be eradicated by mowing because the leaves form a rosette close to the ground.

FIG. 1.—Typical plant of buckhorn (*Plantago lanceolata* L.). From "Farm Weeds in Canada," issued by the Department of Agriculture of the Dominion of Canada.

The seeds of buckhorn (fig. 2, *b*) are of the same general size, shape, weight, and color as those of red clover and alfalfa (fig. 2, *a*), and vary to about the same extent in these characteristics. For this reason it has hitherto been found impracticable to separate the seeds of buckhorn from those of red clover and alfalfa

[a] Under instructions from Mr. Woods, Assistant Chief of Bureau, Mr. Shaw undertook to work out a satisfactory method of separating buckhorn seeds from

by means of any of the methods or machines in use. Most other weed seeds may be cleaned out without much trouble, owing to differences between them and clover seeds in one or more particulars.

Many trials were made in the Bureau of Plant Industry with the best known types of cleaning machines, but they failed to effect a satisfactory separation of buckhorn seeds. Experiments were then undertaken to work out an efficacious method that should be inexpensive and available alike to the farmer and to the seedsman.

FIG. 2.—Seeds of alfalfa (*a*); seeds of buckhorn (*b*). (Natural size.)

THE MUCILAGINOUS PROPERTY OF BUCKHORN SEEDS.

The only point of sufficiently marked difference between buckhorn and clover seeds seemed to be the well-known mucilaginous character of the former. This mucilaginous character is possessed also by the seeds of peppergrass (*Lepidium virginicum* L.) and false flax (*Camelina sativa* Crantz). The mucilage forms a comparatively thick, glossy, transparent, external coating on the normal healthy buckhorn seed and is very absorbent of water. When moistened the seed becomes much swollen and very adhesive. A very small percentage of buckhorn seeds is found to be nonmucilaginous; these are immature or abnormal seeds and possess low vitality.

COATING BUCKHORN SEEDS AFTER MOISTENING THEM.

The idea suggested itself that after moistening the seeds and thus developing the adhesiveness of the buckhorn seeds, an insoluble substance in a fine state of division might be mixed with them, and that a portion of this substance would adhere to the buckhorn seeds. The latter would thus be increased in bulk, surface friction, etc., and might then be separated from the clover or alfalfa seeds by means

clover. The results have been so satisfactory that it is deemed wise to present them briefly for the information of farmers and seedsmen. An application for a patent on the processes described to permit their general and unrestricted use by the public has been filed.—B. T. GALLOWAY, *Chief of Bureau.*

of one of the common types of seed separators, or even by hand sieves. This proved to be the case with the exception of a very small percentage of nonmucilaginous buckhorn seeds (fig. 3, *c*).

FIG. 3.—Alfalfa seeds (*a*); normal buckhorn seeds (*b*); immature or abnormal buckhorn seeds (*c*). (Enlarged three diameters.)

The methods worked out on this principle are inexpensive, expeditious, and may be carried out with the machines already in common use, or even with hand sieves, and the materials needed are likely to be accessible to every farmer and seedsman.

THE DRY SAWDUST METHOD OF SEPARATION.

The alfalfa or red clover seeds infested with buckhorn are covered with water of about room temperature and well stirred in order to wet all the seeds thoroughly. The seeds are allowed to stand in the water for five minutes if the latter is 65° F. or over and for eight minutes if below that temperature. The water is then drained off thoroughly. This may be done with any common strainer or sieve of about 22 meshes to the inch. The moist seeds are then scattered into dry sawdust and thoroughly mixed until the seeds fall apart freely and no small seed masses remain. This mixing may be done with the hands, with a rake on the barn floor, or with any suitable apparatus. It may be accomplished in two or three minutes, when it will be found that the sawdust has absorbed the free surface moisture from the alfalfa seeds, and that all the mucilaginous buckhorn seeds have become coated with the sawdust (fig. 4).

The proportion of dry seeds to sawdust should be as follows: Seeds, one part; sawdust, four or five parts, preferably five parts if resinous sawdust be used.

SIEVES OR SCREENS.

Two screens are required to effect the separation of buckhorn seeds and sawdust from alfalfa seeds; an upper one of sheet zinc, perfo-

FIG. 4.—Buckhorn seeds coated with a grade of sawdust too coarse to pass through a No. 22 mesh (*a*); similar seeds coated with sawdust passed through a No. 22 mesh and from which very fine particles have been screened out (*b*); similar seeds coated with very fine sawdust (*c*); similar seeds coated with white sand (*d*). (Natural size.)

rated with round holes of one-fifteenth-inch diameter (fig. 5), and a lower one of No. 22 mesh wire cloth. The mixture of seeds and sawdust is fed continuously upon the upper screen. The sawdust and free seeds pass through to the lower screen, and the coated buckhorn seeds are retained. The sawdust alone will pass through the lower screen, leaving the clean alfalfa seeds to be discharged by that screen into any suitable receptacle. Care should be taken that too great a quantity of the mixture is not fed upon the upper screen at once, in which case some of the less heavily coated buckhorn seeds may be thrust through, or the sawdust may be rubbed off and the buckhorn seeds allowed to escape.

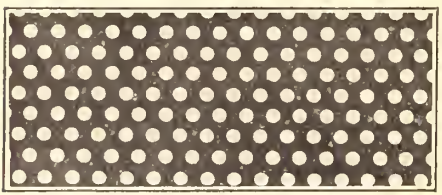

FIG. 5.—Perforated sheet zinc for sieve to separate average grade of red clover and alfalfa seeds. Holes one-fifteenth inch. (Natural size.)

The separation may be undertaken as soon as a thorough mixture of the seeds and sawdust has been effected. The two screens may be used together in a light frame such as may be constructed by any carpenter or by the farmer himself. They may be used in a seed

separator, or in some such box as that shown in figures 6 and 7 if only a small quantity of seeds is to be treated. On the other hand, the seedsman may blow out the sawdust with a fan and separate the buckhorn with a screen. The most common type of seed cleaner is a combination of fan and sieves, the whole separation being effected in one operation. Should the type of machine be employed that operates by means of inclined planes, rebounding angles, and an oscillating motion, the sawdust should first be fanned or sifted out; then such a machine will effect a very complete separation of the buckhorn seeds.

FIG. 6.—Box screen designed by the writer, with interchangeable sliding frames for various sizes of mesh. Suggested for the use of the farmer who may raise but a few acres of clover or alfalfa.

ALFALFA OR RED CLOVER SEEDS IN TWO GRADES.

Should the first-mentioned type of machine or should hand sieves be employed for this work, it is advised that the clover or alfalfa seeds be first separated into two grades—those passing through a round hole of one-fifteenth inch and those too large to pass through such a hole. The latter grade will be found to contain comparatively few buckhorn seeds and will represent but a small proportion of the total seeds. The buckhorn should be separated from the smaller grade by the sheet-zinc sieve already mentioned, and from the larger grade through a similar sieve having holes one-thirteenth

FIG. 7.—The same screen shown in figure 6 with the frame withdrawn to show construction.

of an inch in diameter. If the seeds are thus divided into two grades very few clover or alfalfa seeds will be carried over with the buckhorn seeds. The old methods cause a good deal of waste in this respect.

THE KIND OF SAWDUST TO USE.

Sawdust from any kind of wood may be used. Some of that used by the writer was mixed sawdust from a carpenter shop and some was from a planing mill. All sawdust too coarse to pass through a No. 22 mesh should be discarded, as well as that fine enough to pass through a No. 36 mesh (fig. 8).

FIG. 8.—Mixed sawdust passed through a No. 22 mesh (*a*); sawdust of same grade as *a* but with fine particles (*c*) sifted out through a No. 36 mesh (*b*) (the grade which should be used); fine sawdust sifted from *b*; too fine sawdust (*c*). (Natural size.)

Mr. C. V. Piper, of the Bureau of Plant Industry, suggested the use of the chaff of various grasses, such as fescue and redtop, as being exceedingly light, absorbent, and of the proper size. This was tried and found exceedingly successful. Whenever available it may be used in preference to sawdust (fig. 9). The chaff should be used in exactly the same manner and proportion as the sawdust.

DRY SAND OR ROAD-DUST METHOD.

This method is not considered quite as good as the preceding. Road dust and sand are not nearly as absorbent as the materials just discussed; consequently, a larger proportion of them must be used, say, about one part of seeds to eight of sand or dust. Furthermore, being so much heavier than sawdust or chaff these materials entail more labor. However, the same method is applicable to them. All sand or dust too coarse to pass through a No. 36 mesh should be discarded, as well as that which is so fine as to pass through a No. 50 mesh (see fig. 4, *d*).

WET SAWDUST METHOD.

Use four parts of sawdust prepared as described, two parts of seeds, and one part of water, all by measure. Sprinkle the sawdust with water, stirring or mixing meanwhile until the sawdust is uniformly moistened. An ordinary watering pot may be used for this purpose. Mix in the seeds thoroughly. Compress the moist mass with the

FIG. 9.—Fescue chaff (*a*); buckhorn seeds coated with chaff (*b*). (Natural size.)

hands or a shovel and let it stand for about fifteen minutes so that the buckhorn seeds may have time to thoroughly absorb moisture and become adhesive. Then break up the mass and spread out before a fan, in a current of air, or in a seed drier until quite dry. When dry, separate by any of the methods above described.

AN ALTERNATIVE METHOD.

Sawdust, eight parts; seeds, four parts; water, three parts. Mix the dry seeds and dry sawdust together; then sprinkle the water in and mix thoroughly, as in the process just described. Separate as before.

WET SAND METHOD.

Proceed exactly as with the wet sawdust methods, using the same proportions, but with perhaps rather less water.

AGGLUTINATIVE METHOD.

Moisten the seeds as in the wet sawdust method; drain them thoroughly; place them in a pervious vessel of any kind. In these experiments a piece of perforated sheet zinc was converted into a cylin-

drical vessel. Pack the seeds into such a vessel or into shallow trays having wire-cloth bottoms of No. 20 mesh, or finer. Set these receptacles before a fan, in a current of warm air, in the open air and sunshine, or in a seed drier until the alfalfa seeds fall apart freely. When moderately dry, screen them through sieves as mentioned in describing the dry sawdust method. If the seeds are made too dry the clover will be too easily detached from the buckhorn. The alfalfa seeds will pass through the sieves, but the buckhorn seeds will be found to have collected about themselves a small number of alfalfa seeds, thus forming small seed balls (fig. 10), and these seed balls will not pass through the sieve.

FIG. 10.—Small seed balls, each being a buckhorn seed to which alfalfa seeds cling. (Natural size.)

The loss of good seeds by this method obviously will depend on the number of buckhorn seeds present, but the good seeds thus thrown out may be saved afterwards by one of the other methods if desired. This method is the simplest and, aside from the percentage of alfalfa seeds clinging to the buckhorn seeds, the cheapest to operate. Ordinarily this loss will be from 5 to 10 per cent.

METHOD OF SEPARATION NOT INJURIOUS TO CLOVER AND ALFALFA SEEDS.

In order to be able to assure the readers of this paper that the red clover and alfalfa seeds cleaned by these methods are not injured, germination tests were made with both treated and untreated seeds. No difference in the average germinability could be discovered.

Since the operations subsequent to the application of the sawdust, chaff, etc., are identical with ordinary seed-cleaning processes, other impurities will be eliminated at the same time.

Approved:

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *March 18, 1908.*

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